

REMARKS

Amendment of the Specification Abstract

The specification has been amended to bring the abstract of the disclosure into compliance with word count and to avoid legal terminology. Approval of the amended abstract is earnestly solicited.

Response to Claim Objections and Rejections - 35 USC § 112

The examiner objected to claims 1-3 and also rejected claims 1-3 under 35 USC § 112. Claims 1-3 have now all been amended for clarity, antecedent basis and to otherwise comport with the requirements of 35 USC § 112 as detailed in the amended claims section above. Applicant submits that the claims are now in compliance with 35 USC § 112 and are in condition for allowance based on the amendments and arguments herein.

Traversal of Claim Rejections - 35 USC § 102

Claims 1-3 were rejected under 35 U.S.C. 102(e) as being anticipated by Nowlin et al. In view of the arguments and amendments herein, applicants respectfully traverse the rejection and submit that claims 1-3 are allowable over the references, whether taken singly or in any combination.

Under **§ 102 every aspect** of the rejected claims must be found in a single reference. Applicant respectfully submits that Nowlin et al. fails to anticipate the invention because Nowlin et al. does not teach every aspect of the invention and, in fact, *teaches away* from applicants' invention.

In summary, Nowlin et al. teaches a master/slave system for a surgical robot that incorporates a biasing system like a spring sensor for directly sensing force applied to a set of grip members. Nowlin et al. teaches away from the present invention in that Nowlin et al. uses a direct force sensor, namely, a spring sensor.

See, for example, Nowlin et al. claim 7:

"The robotic system of claim 1 wherein the biasing system comprises a **variable rate spring** that provides altered tactile feedback at the predetermined grip separation." (Claim 7, emphasis added).

See also, for example, FIGS. 11Di and 11Dii illustrating the biasing system of Nowlin et al. having a variable rate spring for providing tactile feedback of an enhanced grip actuation force. A spring sensor is the type of direct force sensing element that the present invention seeks to eliminate and replace with an indirect force sensing estimator. Thus Nowlin et al. actually teaches away from the present invention.

In stark contrast to Nowlin et al. one of the stated features of the present invention is to *indirectly* sense reaction forces without the need for conventional force sensors, and without being influenced by signal noise, the natural frequency of a sensor itself, and sensor inertia (Para. 0115). To this end, the reaction force detection means of the present invention comprises reaction force estimation observers 2, 4 as illustrated in FIG. 6. As shown in FIG. 6 the reaction force estimation observers *indirectly* sense reaction forces without the use of a strain gauge, spring sensors or other such mechanical force sensors. Instead, reaction forces are estimated from a driving signal, such as reference current I_a^{ref} , and position x . (Para. 0110 and FIG. 6). Thus the benefits of the invention over conventional force measurement devices are realized.

Nothing in Nowlin et al. or any of the references teach a limitation to an indirect sensing means such as the reaction force detection means here. More specifically, Nowlin et al. does not disclose or otherwise anticipate at least the following claim limitations as required by § 102:

Claim 1 (currently amended)... (iii) reaction force detection means for estimating a reaction force which the object receives, where the reaction force is detected indirectly based on a position signal outputted from the position detection means and a driving signal applied to the driving means...

While there are other significant differences between the claim elements of the present invention and the reference, to traverse a § 102 rejection it is necessary to find

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only one claim element that is not taught by the single reference. Here it is evident that Nowlin et al. does not teach the reaction force detection means of the invention for indirectly detecting reaction force. Nowlin et al. instead teaches away from the claimed invention by using a variable spring or other biasing system that directly measures forces. Therefore, claim 1 is allowable over Nowlin et al. and any of the cited references whether taken singly or in any combination.

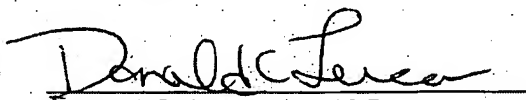
Claim 2, as amended, also includes a limitation to "reaction force detection means for estimating a reaction force undergone by the object, where the reaction force is detected indirectly..." Claim 3, as amended, includes similar limitations. By argument and amendment analogous to Claim 1, claims 2 and 3 are also allowable over Nowlin et al. and any of the cited references whether taken singly or in any combination.

Applicants have made a diligent effort to place the claims in condition for allowance. However, should there remain unresolved issues that require adverse action, it is respectfully requested that the Examiner telephone Applicants' Attorney so that such issues may be resolved as expeditiously as possible.

In view of the foregoing, it is respectfully submitted that the application is in condition for allowance and such action is respectfully requested. Should any extensions of time or fees be necessary in order to maintain this Application in pending condition, appropriate requests are hereby made and authorization is given to debit Account # 02-2275.

Respectfully submitted,
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